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[Intergalactic dust] Constraint on intergalactic dust from thermal history of intergalactic medium [A. K. Inoue & H. Kamaya] Akio K. InoueE-mail:inoue@kusastro.kyoto-u.ac.jp Research Fellow of the JSPS and Hideyuki Kamaya

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abstract

This Letter investigates the amount of dust in the intergalactic medium (IGM). The dust photoelectric heating can be the most efficient heating mechanism in the IGM where the density is very small and there are a lot of hard ultraviolet photons. Comparing the observational thermal history of IGM with a theoretical one taking into account the dust photoelectric heating, we can put an upper limit on the dust-to-gas ratio, $\mathcal{D}$, in the IGM. Since the rate of the dust photoelectric heating depends on the size of dust, we find the following results: If the grain size is 100 Å, $\mathcal{D}$ at $z \sim 3$ is 1/100 Galactic value corresponding to $\Omega_{\rm dust}^{\rm IGM} 10^{-5}$. On the other hand, if the grain size is as small as $\sim$ 10 Å, $\mathcal{D}$ is 1/1000 Galactic value corresponding to $\Omega_{\rm dust}^{\rm IGM} 10^{-6}$.